Supporting Information

Folic acid-functionalized, condensed magnetic nanoparticles for targeted delivery of doxorubicin to tumor cancer cells overexpressing the folate receptor

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Figure S1. Basic physicochemical characteristics (size and ζ-potential) of the Mag-Alg-PEG-FA nanoparticles after loading with (50, 100, 150, 200 μg/ml) DOX. (A) Average size, (B) ζ-potential and (C) polydispersity index (PDI).

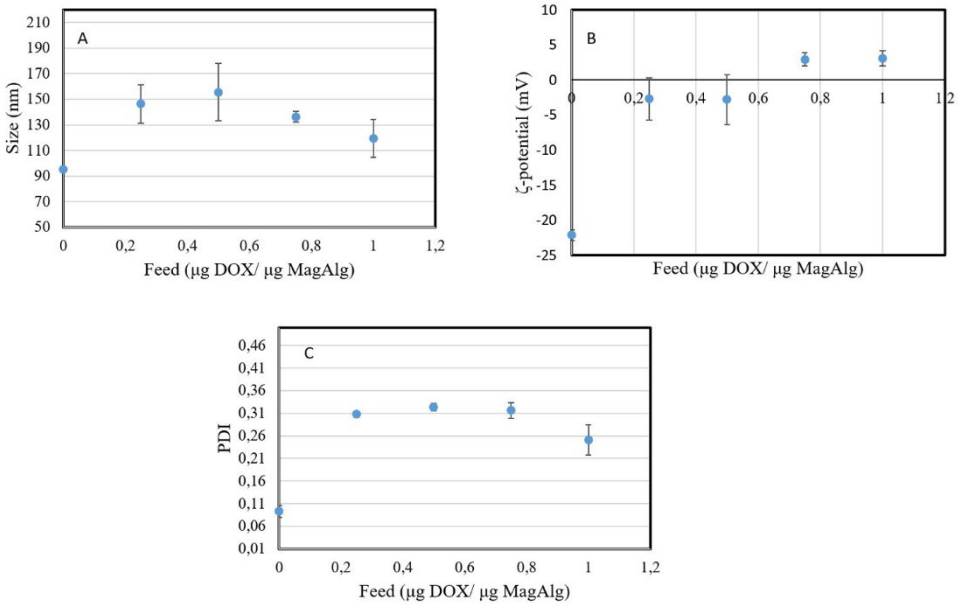
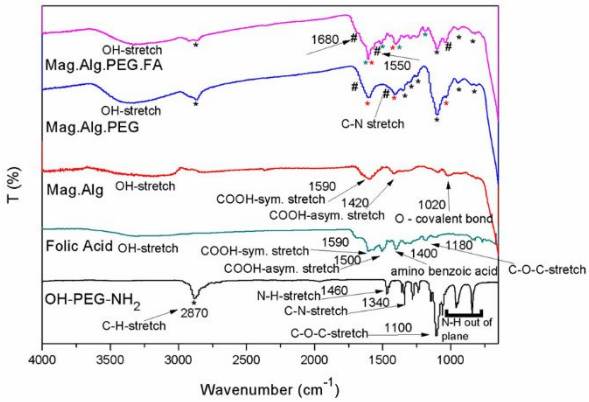


Figure S2. ATR spectra for the magnetic nanoparticles of Mag-Alg-PEG-FA nanoparticles (magenta line), folic acid (cyan line), Mag-Alg-PEG nanoparticles (blue line), Mag-Alg nanoparticles (red line) and OH-PEG-NH_2 (black line). Alg: alginate; Mag: Magnetic; FA: folic acid



In the case of Mag-Alg (red line) nanoparticles the broad peak in the region 3100 – 3500 cm^{-1} corresponded to the hydroxyl groups (-OH) of alginate. The peaks at 1590 and 1420 cm^{-1} are assigned to the symmetric and asymmetric stretching vibrations of carboxyl groups (-COOH) of alginate, respectively, depicting the successful presence of alginate in the nanoparticles. Moreover, the peaks at 1020 cm^{-1} is atributede to the oxygen covalent bonding of alginate in the nanoparticles. In the Mag-Alg-PEG nanoparticles (blue line), the successful pegylation was suggested by the presence of characteristic stretching vibration bands in the PEG chain at 2870 cm^{-1} (C-H stretch. vibration) and in the range 1300 – 1200 cm^{-1} (C-O-C stretch. vibration) and by the presence of N-H out of plane stretching vibrations in the range 770 – 970 cm^{-1}. The conjugation of PEG on Mag-Alg surface was supported by the distinct C-N stretching vibration bands of amide bonding at 1650 and 1450 cm^{-1}. As for Mag-Alg-PEG-FA nanoparticles (magenta line), the successful FA conjugation on the hydroxyl (-OH) terminal group of PEG chain by an ester linkage was confirmed from the presence of peaks at 1680 and 1508 cm^{-1}, corresponding to the stretching vibration bands of C=O and CO-O ester, respectively

Figure S3. Average size change upon 48-h incubation of the Mag-Alg-PEG(5kDa)-FA nanoparticles in comparison with Mag-Alg-PEG(2kDa) nanoparticles in human blood plasma (diluted 50% v/v). RPMI: Roswell Park Memorial Institute.

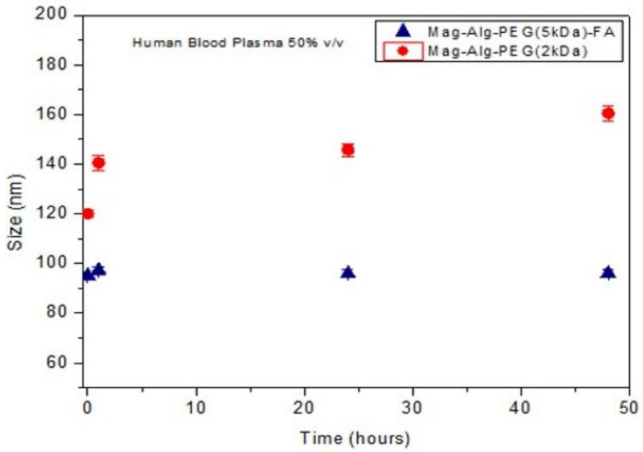


Figure S4. Rhodamine release from Mag-Alg-PEG-FA magnetic nanoparticles

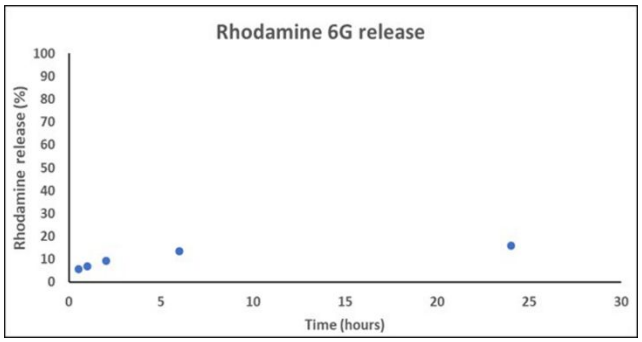


Figure S5. Confocal fluorescence microscopy images of the uptake of rhodamine-labeled magnetic nanoparticles by the MCF-7 cancer cells at 1, 4, and 24 h under a static magnetic field. From left to right, the panels in each row show fluorescence from DAPI (nuclei stained blue), lysotracker green (staining acidic intracellular compartments), rhodamine 6G (rhodamine-conjugated nanocarriers, red), and merged images. In merged pictures, co-localization of rhodamine with lysotracker green gives yellow-orange-colored areas and the co-localization of rhodamine with DAPI purple-colored areas.

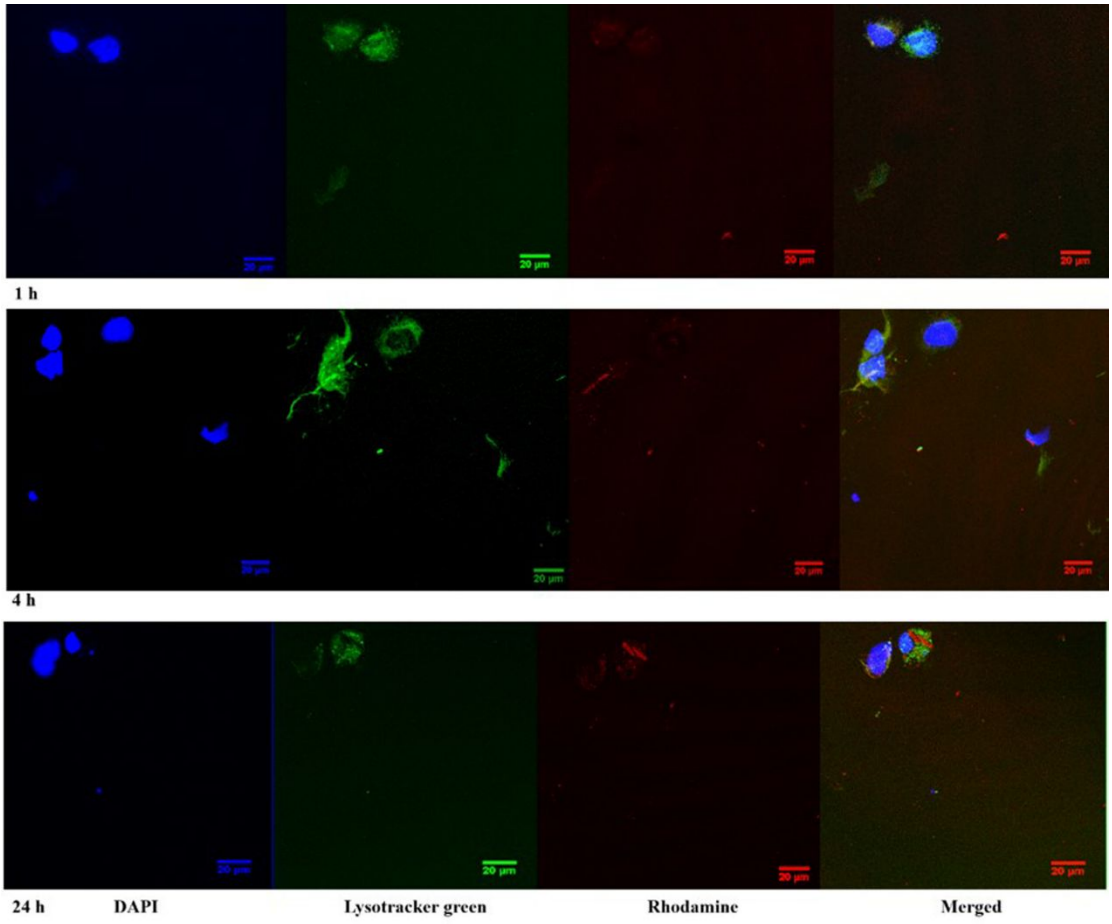


Figure S6. Confocal fluorescence microscopy images of the uptake of rhodamine-labeled magnetic nanoparticles by the MCF-7 cancer cells at 1, 4, and 24 h without a static magnetic field. From left to right, the panels in each row show fluorescence from DAPI (nuclei stained blue), lysotracker green (staining acidic intracellular compartments), rhodamine 6G (rhodamine-conjugated nanocarriers, red), and merged images. In merged pictures, co-localization of rhodamine with lysotracker green gives yellow-orange-colored areas and the co-localization of rhodamine with DAPI purple-colored areas.

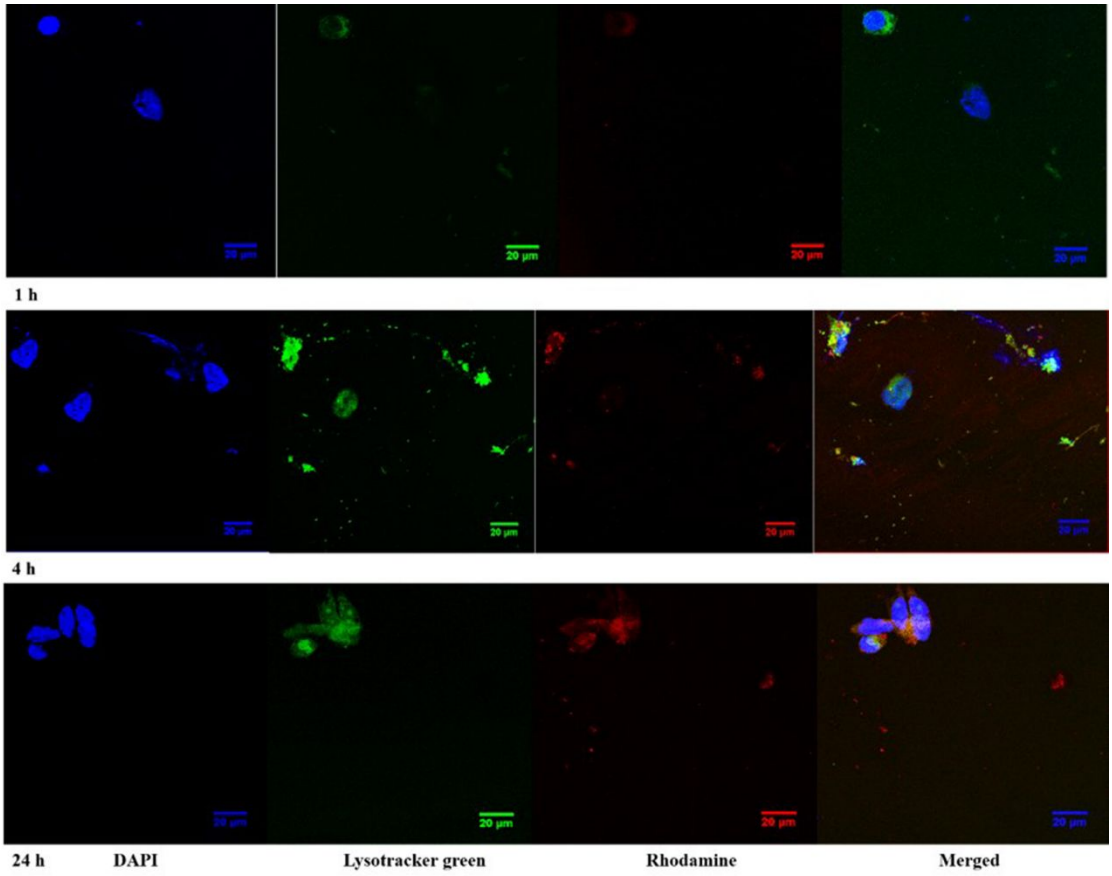


Figure S7. Confocal fluorescence microscopy images of the uptake of rhodamine-labeled magnetic nanoparticles by the MDA-MB 231 cancer cells at 1, 4, and 24 h without a static magnetic field. From left to right, the panels in each row show fluorescence from DAPI (nuclei stained blue), lysotracker green (staining acidic intracellular compartments), rhodamine 6G (rhodamine-conjugated nanocarriers, red), and merged images. In merged pictures, co-localization of rhodamine with lysotracker green gives yellow-orange-colored areas and the co-localization of rhodamine with DAPI purple-colored areas.